

690.3 CIP/C/CIP/C2

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Desaraju V. VARAPRASAD et al. : Examiner: Not yet assigned
Application No.: Rule 1.53(b) : Group Art Unit:
Continuation of 09/251,937) Not yet assigned
Filed: Herewith)
For: ELECTROCHROMIC POLYMERIC) Date: April 16, 2001
SOLID FILMS, MANUFACTURING
ELECTROCHROMIC DEVICES USING
SUCH SOLID FILMS, AND PROCESSES
FOR MAKING SUCH FILMS AND DEVICES

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to examination on the merits, please amend
the above-identified application as follows:

IN THE SPECIFICATION:

Please substitute the Related United States Patent
Applications starting at page 1, line 11 and ending at page
1, line 18 with the following replacement section. A marked-
up copy of this section, showing the changes made thereto, is
attached.

This application is a continuation of United States
patent application No. 09/251,937, filed February 18, 1999
(allowed), which is a continuation of United States patent

application No. 08/824,501, filed March 27, 1997, now U.S. Patent No. 5,910,854 (now abandoned), which is a continuation-in-part of United States patent application Serial No. 08/406,663, filed March 20, 1995 (now abandoned), which is a continuation of United States patent application Serial No. 08/193,557, filed February 8, 1994 (now abandoned), which is a continuation-in-part of United States patent application Serial No. 08/023,675, filed February 26, 1993 (now abandoned).

Please substitute the paragraph starting at page 63, line 15 and ending at page 64, line 36 with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

Electromagnetic radiation in the near-infrared and far-infrared (including short and long wavelengths from 3 microns to 30 microns and beyond) regions of the electromagnetic spectrum can be used, as can radiation in other regions such as microwave radiation. Thus, for electrochromic monomer compositions responsive to energy input that includes thermal energy, radiant heaters that emit in the infrared region and couple energy into the monomer composition can be used. For compositions responsive to microwave energy, a microwave generator can be used. Also, for systems that respond, for example, to a combination of energy inputs from different regions of the electromagnetic

spectrum, a combined energy radiator can be used. For example, the Fusion UV Curing System, Sunlight UV Chamber, Hanovia UV Curing System, and RC-500A Pulsed UV Curing System described above emit energy efficiently in both the ultraviolet region and the infrared region, and thus effect a cure both by photoinitiation and thermally. For systems responsive to thermal influences, ovens, lehrs, conveyerized ovens, induction ovens, heater banks and the like can be used to couple energy into the electrochromic monomer composition by convection, conduction and/or radiation. Also, chemical initiators and catalysts, photo initiators, latent curing agents (such as are described in copending US Patent Application 08/429,643, the disclosure of which is hereby incorporated by reference herein) and similar chemical accelerants can be used to assist conversion of the electrochromic monomer composition into a cross-linked solid polymer matrix. By customizing and selecting the components of the electrochromic monomer composition, cure can be retarded/suppressed until after the composition is applied within the cavity of the electrochromic cell. Thereafter, by exposure to electromagnetic radiation or thermal influence, cure to the solid polymer matrix polychromic film can be accelerated. Since devices will not typically be consumer used until at least days (often weeks or months) after initial application of the monomer composition within the interpane cell cavity, electrochromic monomer compositions

can be composed that in situ cure at room temperature (typically 15° to 30°C) over time once established within the interpane cavity (for example, within 24 hours).

Alternately, electrochromic devices can be thermally in situ cured in an oven at a temperature, for example, of 60°C or higher for a time period of, for example, five minutes or longer with the particular oven temperature and oven dwell time being readily established by experimentation for any given electrochromic monomer composition. For example, we find good results by exposure of the tin catalyzed compositions of the Examples to about 80°C in an oven for about two hours. If faster curing systems are desired, then the monomer composition can be appropriately adjusted, particularly by appropriate selection of the type and concentration of initiators, curing agents, catalysts, cross-linking agents, accelerants, etc.

Please substitute the paragraph starting at page 70, line 1 with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

A further recitation of weather barrier materials and types (including single and double weather barrier constructions) is found in copending US Patent Application 08/429,643 filed April 27, 1995, the disclosure of which is hereby incorporated by reference herein, including flexible

weather barrier materials that are beneficial when the polychromic solid film devices of this invention are exposed to wide and rapid oscillation between temperature extremes, such as the thermal shocks experienced during normal use in or on a vehicle in regions of climate extremes. Also, devices, such as electrochromic rearview mirrors utilizing a polychromic solid film, can be constructed suitable for use on automobiles, and suitable to withstand accelerated aging testing such as boiling in water for an extended period (such as 96 hours or longer); exposure to high temperature/high humidity for an extended period (for example, 85°C/85% relative humidity for 720 hours or longer); exposure within a steam autoclave for extended periods (for example, 121°C; 15-18 psi steam for 144 hours or longer).

Please substitute the paragraph starting at page 77, line 25 and ending at page 78, line 6 with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto is attached.

An insulating demarcation means, such as demarcation lines, dots and/or spots, may be placed within electrochromic devices, such as mirrors, glazings, optically attenuating contrast filters and the like, to assist in creating the interpane distance of the device and to enhance overall performance, in particular the uniformity of coloration across large area devices. Such insulating

demarcation means, constructed from, for example, epoxy coupled with glass spacer beads, plastic tape or die cut from plastic tape, may be placed onto the conductive surface of one or more substrates by silk-screening or other suitable technique prior to assembling the device. The insulating demarcation means may be geometrically positioned across the panel, such as in a series of parallel, uniformly spaced-apart lines, and may be clear, opaque, tinted or colorless and appropriate combinations thereof, so as to appeal to the automotive stylist.

Please substitute the paragraph starting at page 78, line 8 with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto is attached.

If the interpane distance between the substrates is to be, for example, about 250 μm , then the insulating demarcation means (being substantially non-deformable) may be screened, acted or adhered to the conductive surface of a substrate at a lesser thickness, for example, about 150 μm to about 225 μm . Of course, if substantially deformable materials are used as such demarcation means, a greater thickness, for example, about 275 μm to about 325 μm , may be appropriate as well. Alternatively, the insulating demarcation means may have a thickness about equal to that of

the interpane distance of the device, and actually assist in bonding together the two substrates of the device.

Please substitute the paragraph starting at page 80, line 16 and ending at page 82, line 6 with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto is attached.

Fabrication of electrochromic multi-radius/aspheric or spherical/convex mirrors can benefit from single or tandem bending such as is described in copending US Patent Application 08/429,643, the disclosure of which is hereby incorporated by reference herein. Convex or multi-radius minilites/shapes can, for example, be individually bent [and thereafter ITO coated or metal reflector coated (such as with a chromium metal reflector, a chromium undercoat, rhodium overcoat metal reflector, a chromium undercoat/aluminum overcoat reflector, or their like, such as is described in US Patent Application 08/429,643 and then the individual bent minilites/shapes can be selectively sorted so that the best matched pairs from a production batch can be selected. For example, bent convex or aspheric minilites/shapes can be bent in production lots such as of 100 pieces or thereabouts. Thereafter, each individual bent minilite/shape is placed in a vision system where the reflection of a pattern of dots, squares, lines, circles, ovals (or the like) is photographed using a digital camera and the position of individual dots, etc. in the pattern, as reflected off the individual

minilite/shape being measured, is captured and stored digitally in a computer storage. Each individual minilite/shape, in turn, is similarly measured and a digital image of the reflected image of each part's pattern is also computer stored. An identifier is allocated to each minilite/shape and to its corresponding computer stored record of the reflected image of the pattern. Next, a computer program finds which combination of two minilites/shapes have most closely matched reflected images of the fixed pattern (which typically is a dot matrix or the like). This is achieved, for example, by finding how close the center of one reflected dot on a given part is located apart from its corresponding dot on another part. For perfectly matched parts, corresponding dots coincide; when they are located apart, then a local mismatch is occurring. Thus, by using a dot matrix of, for example, 10 to 100 dots reflected off a given part, and forming the sum of the squares of the absolute inter-dot distances to give a figure of merit for each putative from match, then minilites/shapes can be selectively sorted by selecting the matched pairs with the lowest inter-dot distances as indicated by the smallest figure of merit. Alternately, a pattern with a measured, pre-established distortion can be designed such that, upon reflection off the convex (or concave) surface of a bent minilite/shape, the pattern is reflected as straight, parallel lines. The equipment suitable to use in a vision

system is conventional in the machine vision art and includes a digital camera (such as a charge coupled device (CCD) camera or a video microchip camera (CMOS camera)), a frame grabber/video computer interface, and a computer. Typically the camera is mounted above (typically 1 foot to 4 feet above, or even farther above) the subject minilite/shape, and the camera views through the pattern (that typically is an illuminated light box with the pattern incorporated therein) to view the pattern's reflection off the convex (or, if desired, the concave) surface of the bent part. If desired, optical calculations can be made that allow determination of the actual profile of the bent glass based upon measurements taken and calculated from the pattern's reflection.

Please substitute the paragraph starting at page 82, line 8 and ending at page 83, line 24 with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto is attached.

Also, an aspheric electrochromic (or a convex electrochromic) mirror can be used as an interior rearview mirror, and can be packaged as a clip-on to an existing vehicular rearview mirror in a manner that is similar to aftermarket wide angle mirrors conventionally known. Such interior aspheric/convex electrochromic mirrors can optionally be solar powered or be powered by a battery pack, for ease of installation in the vehicular aftermarket.

Should it be desirable to minimize weight for convex or aspheric inside or outside mirrors, then thin glass (in the thickness range of about 1 mm to about 1.8 mm, or even thinner) can be used for one or both of the substrates used in a laminate electrochromic assembly. Use of such thin glass is described in copending US Patent Application 08/429,643 filed April 27, 1995, the disclosure of which is hereby incorporated by reference herein. Also, cutting of convex and especially aspheric glass can benefit from computer numerical controlled (CNC) cutting where a cutting head is moved under digital computer control. In this regard, a multi-axis CNC cutter is preferred where the cutting head (which may be a diamond tool or wheel, a laser beam, a water jet, an abrasive water jet, or the like) can be moved in three dimensions. Most preferably, and especially for cutting aspheric bent glass, a cutter that moves in three-dimensions but that keeps the cutting tool (such as a diamond wheel) normal (i.e., with a cutting wheel axis at or close to 90° to the tangential plane of the bent glass surface) is preferred. For example, a cutting machine such as available from LASER Maschinenbau GmbH & Company KG, Grossbetlingen, Germany can be used to cut aspheric glass. In such a system, the bent glass lite/minilite from which the shape is to be cut is mounted on a support arm that is movable in three dimensions and that generally moves in three dimensions either CNC driven, or by following a cam, along

the three-dimensional profile of the aspheric shape being cut. Also, the cutting wheel can be adjusted so that its angle relative to a tangent to the glass at point of cut is close to 90° (and not less than about 70° ; not less than about 80° more preferred and not less than about 85° most preferred). In this manner, movement of the cutting support under the cutting wheel, in combination with adjustment of the pitch of the cutting wheel itself, maintains as close to normal (i.e., 90°) the cutting angle as possible, and thus achievement of a clean, efficient cut and breakout of the shape. While particularly beneficial for aspheric shapes where the radius can change from about 2000 mm to below 600 mm, and smaller, across the surface of the shape, cutting of convex glass can also benefit from maintenance of a near normal cutting angle for the cutting tool (i.e., cutting wheel).

IN THE CLAIMS:

Prior to examination, please cancel claims 2-27.

REMARKS

The claim is 1. Claims 2-27 have been cancelled in anticipation of filing additional claims prior to any action on the merits. If the case should be picked up prior to the submission of new claims, the Examiner is respectfully requested to contact the undersigned.


Applicants have amended the specification to correct minor typographical and transcription errors. Thus, these changes are not new matter.

The Examiner will note that, as in the parent application, application No. "08/547,578" has been replaced at several points in the specification where it was incorrectly recited. The correct application number is 08/429,643. This copending application is referred to at other points in the specification, e.g. pages 49, 50 and 84. In addition, the subject matter of the 08/429,643 application is incorporated by reference in the present application. Accordingly, this correction is not new matter.

In addition, at page 78, lines 5 and 9, Applicants have corrected two typographical errors. Thus, these changes are not new matter.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES
MADE TO THE SPECIFICATION

The Related United States Patent Applications
section starting at page 1, line 11 and ending at page 1,
line 18 has been amended as follows:

This application is a continuation of United States
patent application No. 09/251,937, filed February 18, 1999
(allowed), which is a continuation of United States patent
application No. 08/824,501, filed March 27, 1997, now U.S.
Patent No. 5,910,854 (now abandoned), which is a
continuation-in-part of United States patent application
Serial No. 08/406,663, filed March 20, 1995 (now abandoned),
which is a continuation of United States patent application
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abandoned), which is a continuation-in-part of United States
patent application Serial No. 08/023,675, filed February 26,
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far-infrared (including short and long wavelengths from 3

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polymer matrix. By customizing and selecting the components of the electrochromic monomer composition, cure can be retarded/suppressed until after the composition is applied within the cavity of the electrochromic cell. Thereafter, by exposure to electromagnetic radiation or thermal influence, cure to the solid polymer matrix polychromic film can be accelerated. Since devices will not typically be consumer used until at least days (often weeks or months) after initial application of the monomer composition within the interpane cell cavity, electrochromic monomer compositions can be composed that in situ cure at room temperature (typically 15° to 30°C) over time once established within the interpane cavity (for example, within 24 hours). Alternately, electrochromic devices can be thermally in situ cured in an oven at a temperature, for example, of 60°C or higher for a time period of, for example, five minutes or longer with the particular oven temperature and oven dwell time being readily established by experimentation for any given electrochromic monomer composition. For example, we find good results by exposure of the tin catalyzed compositions of the Examples to about 80°C in an oven for about two hours. If faster curing systems are desired, then the monomer composition can be appropriately adjusted, particularly by appropriate selection of the type and concentration of initiators, curing agents, catalysts, cross-linking agents, accelerants, etc.

The paragraph starting at page 70, line 1 has been amended.

A further recitation of weather barrier materials and types (including single and double weather barrier constructions) is found in copending US Patent Application [08/547,578 filed October 24, 1995] 08/429,643 filed April 27, 1995, the disclosure of which is hereby incorporated by reference herein, including flexible weather barrier materials that are beneficial when the polychromic solid film devices of this invention are exposed to wide and rapid oscillation between temperature extremes, such as the thermal shocks experienced during normal use in or on a vehicle in regions of climate extremes. Also, devices, such as electrochromic rearview mirrors utilizing a polychromic solid film, can be constructed suitable for use on automobiles, and suitable to withstand accelerated aging testing such as boiling in water for an extended period (such as 96 hours or longer); exposure to high temperature/high humidity for an extended period (for example, 85°C/85% relative humidity for 720 hours or longer); exposure within a steam autoclave for extended periods (for example, 121°C; 15-18 psi steam for 144 hours or longer).

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If the interpane distance between the substrates is to be, [fot ample,] for example, about 250 μm , then the insulating demarcation means (being substantially non-deformable) may be screened, acted or adhered to the

conductive surface of a substrate at a lesser thickness, for example, about 150 μm to about 225 μm . Of course, if substantially deformable materials are used as such demarcation means, a greater thickness, for example, about 275 μm to about 325 μm , may be appropriate as well. Alternatively, the insulating demarcation means may have a thickness about equal to that of the interpane distance of the device, and actually assist in bonding together the two substrates of the device.

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or aspheric minilites/shapes can be bent in production lots such as of 100 pieces or thereabouts. Thereafter, each individual bent minilite/shape is placed in a vision system where the reflection of a pattern of dots, squares, lines, circles, ovals (or the like) is photographed using a digital camera and the position of individual dots, etc. in the pattern, as reflected off the individual minilite/shape being measured, is captured and stored digitally in a computer storage. Each individual minilite/shape, in turn, is similarly measured and a digital image of the reflected image of each part's pattern is also computer stored. An identifier is allocated to each minilite/shape and to its corresponding computer stored record of the reflected image of the pattern. Next, a computer program finds which combination of two minilites/shapes have most closely matched reflected images of the fixed pattern (which typically is a dot matrix or the like). This is achieved, for example, by finding how close the center of one reflected dot on a given part is located apart from its corresponding dot on another part. For perfectly matched parts, corresponding dots coincide; when they are located apart, then a local mismatch is occurring. Thus, by using a dot matrix of, for example, 10 to 100 dots reflected off a given part, and forming the sum of the squares of the absolute inter-dot distances to give a figure of merit for each putative from match, then minilites/shapes can be selectively sorted by selecting the

matched pairs with the lowest inter-dot distances as indicated by the smallest figure of merit. Alternately, a pattern with a measured, pre-established distortion can be designed such that, upon reflection off the convex (or concave) surface of a bent minilite/shape, the pattern is reflected as straight, parallel lines. The equipment suitable to use in a vision system is conventional in the machine vision art and includes a digital camera (such as a charge coupled device (CCD) camera or a video microchip camera (CMOS camera)), a frame grabber/video computer interface, and a computer. Typically the camera is mounted above (typically 1 foot to 4 feet above, or even farther above) the subject minilite/shape, and the camera views through the pattern (that typically is an illuminated light box with the pattern incorporated therein) to view the pattern's reflection off the convex (or, if desired, the concave) surface of the bent part. If desired, optical calculations can be made that allow determination of the actual profile of the bent glass based upon measurements taken and calculated from the pattern's reflection.

The paragraph starting at page 82, line 8 and ending at page 83, line 24 has been amended.

Also, an aspheric electrochromic (or a convex electrochromic) mirror can be used as an interior rearview mirror, and can be packaged as a clip-on to an existing

vehicular rearview mirror in a manner that is similar to aftermarket wide angle mirrors conventionally known. Such interior aspheric/convex electrochromic mirrors can optionally be solar powered or be powered by a battery pack, for ease of installation in the vehicular aftermarket. Should it be desirable to minimize weight for convex or aspheric inside or outside mirrors, then thin glass (in the thickness range of about 1 mm to about 1.8 mm, or even thinner) can be used for one or both of the substrates used in a laminate electrochromic assembly. Use of such thin glass is described in copending US Patent Application [08/547,578 filed October 24, 1995,] 08/429,643 filed April 27, 1995, the disclosure of which is hereby incorporated by reference herein. Also, cutting of convex and especially aspheric glass can benefit from computer numerical controlled (CNC) cutting where a cutting head is moved under digital computer control. In this regard, a multi-axis CNC cutter is preferred where the cutting head (which may be a diamond tool or wheel, a laser beam, a water jet, an abrasive water jet, or the like) can be moved in three dimensions. Most preferably, and especially for cutting aspheric bent glass, a cutter that moves in three-dimensions but that keeps the cutting tool (such as a diamond wheel) normal (i.e., with a cutting wheel axis at or close to 90° to the tangential plane of the bent glass surface) is preferred. For example, a cutting machine such as available

from LASER Maschinenbau GmbH & Company KG, Grossbettingen, Germany can be used to cut aspheric glass. In such a system, the bent glass lite/minilite from which the shape is to be cut is mounted on a support arm that is movable in three dimensions and that generally moves in three dimensions either CNC driven, or by following a cam, along the three-dimensional profile of the aspheric shape being cut. Also, the cutting wheel can be adjusted so that its angle relative to a tangent to the glass at point of cut is close to 90° (and not less than about 70° ; not less than about 80° more preferred and not less than about 85° most preferred). In this manner, movement of the cutting support under the cutting wheel, in combination with adjustment of the pitch of the cutting wheel itself, maintains as close to normal (i.e., 90°) the cutting angle as possible, and thus achievement of a clean, efficient cut and breakout of the shape. While particularly beneficial for aspheric shapes where the radius can change from about 2000 mm to below 600 mm, and smaller, across the surface of the shape, cutting of convex glass can also benefit from maintenance of a near normal cutting angle for the cutting tool (i.e., cutting wheel).

Atty. Docket No. 690.3 CIP/C/CIP/C2

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MADE TO THE CLAIMS

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